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TITLE OF THE INVENTION

HOPPER KEY FOR IMAGE FORMING APPARATUS AND TONER REFILLING KIT INCLUDING THE SAME

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

The invention relates to a key for opening a hopper of an image forming apparatus, and particularly to a key for unlocking a locking-type hopper of an image forming apparatus, and a toner refilling kit including such a key.

2. DISCUSSION OF THE BACKGROUND

Image forming apparatuses, such as printers, photocopiers and facsimiles, typically apply a thermosetting image forming substance such as dry ink or what is commonly referred to as "toner," in order to form images on paper, for example. As image forming processes are performed, the toner is eventually depleted and therefore, must be refilled. Known image forming apparatuses are constructed with an array devices related to refilling the toner reservoir included in the image forming apparatus. For example, a toner reservoir in an image forming apparatus may have a hingedly attached lid that is simply opened by hand, allowing toner to be poured into the reservoir, from a bottle, for example. Alternatively, the reservoir may include a specialized coupling for engaging corresponding devices provided on replacement containers that are inserted into the image forming apparatus and which remain in the image forming apparatus during use, and which must be entirely replaced when toner is to be added to the image forming apparatus. Similarly, some toner reservoirs of image forming apparatuses, in order to be refilled, must be unlocked, and engaged with a specialized container which is

opened after engaging the container with the reservoir. After the hopper is refilled, the specialized container is disengaged and discarded or returned to the manufacturer for refilling.

For example, referring to Figures 12-19, a refilling operation using a typical refill container is shown therein. As shown in Figures 12 to 14, an access panel 102 of image forming apparatus 100 is rotated downward to expose toner hopper release lever 104 and toner hopper 106. As shown in Figures 13 and 14, after hopper release lever 104 is rotated downwardly, as viewed in Figure 13, toner hopper 106 can be pulled outwardly, in direction of arrow 108, so as to expose hopper lid 110. In this image forming apparatus, toner hopper 106 is a locking-type toner hopper, in which the lid 110 is locked in a closed position as shown in Figure 14. In order to open lid 110, toner refill cartridge manufacturers have been known to provide an unlocking device incorporated onto a toner cartridge, such as toner cartridge 112. As shown in Figure 16, the toner cartridge 112 includes an unlocking device 114 which includes two pins 116 for insertion into apertures 118 of the locking device 120 incorporated into hopper 106. As shown in Figure 17, once pins 116 are inserted into apertures 118, lid 110 can be rotated upwards to expose the interior of the hopper 106. As shown in Figures 18 and 19, once lid 110 is opened, toner cartridge 112 can be installed onto hopper 106 and subsequently opened so as to drop the toner stored in toner cartridge 112, into hopper 106. As shown in Figures 18 and 19, toner cartridge 112 includes specialized components, such as tabs 122 which fit into recesses 124 of hopper 106. After the toner containing toner cartridge 112 has been emptied into hopper 106, lid 110 can be closed, and hopper 106 can be returned to its operating position.

However, such specialized refill containers are expensive to manufacture due to the differing couplings required for engaging each specific toner hopper, which can add significant overhead costs to operating and maintaining image forming apparatuses. In addition, if a

business has a number of different types of photocopiers, an inventory of different specialized toner refill containers must be maintained. Therefore, it is desirable to simplify and minimize the costs involved with refilling toner reservoirs of image forming apparatuses.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a device for reducing the complexity and costs associated with refilling toner reservoirs of image forming apparatuses. It is a further object of the invention to provide a kit which includes the necessary tools for simplifying the refilling of reservoirs which has heretofore required specialized products.

These and other objects of the invention can be provided by the present invention, which provides a key for unlocking a toner hopper of an image forming apparatus. At least one protrusion is attached to a first member, the protrusion configured to unlock a locking-type toner hopper of an image forming apparatus. The key is not formed monolithically with a toner container.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the present invention, and many of the attendant advantages thereof, will be readily ascertained and/or obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a key for unlocking a hopper of an image forming apparatus, according to the present invention.

Figure 2 is a side elevational view of a toner refilling kit according to one aspect of the present invention.

Figure 3 is a perspective view illustrating the movement of an access panel of an image forming apparatus.

Figure 4 is a perspective view of an image forming apparatus illustrating the movement of a hopper of the image forming apparatus.

Figures 5 and 6 are perspective views of a hopper of an image forming apparatus and illustrate the operation of a key for unlocking the hopper according to the present invention.

Figure 7 is a perspective view of an image forming apparatus illustrating the movement of a lid of a hopper of an image forming apparatus.

Figure 8 is a perspective view of a toner container.

Figure 9 is a perspective view of an image forming apparatus illustrating the use of a toner bottle to refill the hopper.

Figure 10 is a perspective view of an image forming apparatus illustrating movement of closing the lid on the hopper.

Figure 11 is a perspective view of an image forming apparatus illustrating the movement of the access panel for closing the image forming apparatus.

Figures 12 is a perspective view of a known image forming apparatus.

Figures 13 and 14 are perspective views illustrating the removal of a hopper from a known image forming apparatus.

Figure 15 illustrates a known toner cartridge.

Figure 16 illustrates the use of a known toner cartridge for unlocking a toner hopper.

Figure 17 is a perspective view of a toner cartridge used for unlocking a locking type toner hopper.

Figures 18 and 19 illustrate the use of a nontoner cartridge for refilling a toner hopper.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Examples of preferred embodiments of the present invention will now be described with reference to the drawings, wherein like reference numbers throughout the several views identify like and/or similar elements.

Figure 1 illustrates a key for unlocking a hopper according to the present invention. As shown in the figure, key 10 includes a body 12, at least one projection 14, and is formed separately from a toner refill container. Projection 14 is configured to unlock a lock for the lid of a toner hopper of an image forming apparatus (described in detail below).

In another preferred embodiment, key 10 includes at least two parallel projections 16 having a spacing 18. The at least two projections 16 are arranged so as to be received by a lock of a toner hopper of an image forming apparatus. Additionally, key 10 can include at least two parallel second projections 20 having spacing 22, wherein spacing 22 is longer than spacing 18. This allows key 10 to be used on at least two different locking-type toner hoppers of image forming apparatuses. As shown in Figure 1, first member 12 can be of any shape, but is preferably substantially planar, which is simple to manufacture. Preferably, member 12 is of such a size so as to be easily grasped by a human hand.

Referring now to Figure 5, toner hopper 24 includes locking mechanism 26. As shown in Figure 6, locking mechanism 26 includes a pair of apertures 28.

A refilling procedure for refilling toner hopper 24 will now be described below.

Referring now to Figure 3, when it is desired to refill a toner hopper of an image forming apparatus, such as photocopier 42 as shown in Figure 3, it is usually necessary to open an access panel such as access panel 44 as shown in Figure 3. Thereafter, a toner hopper release lever 46 is rotated as shown in Figure 3, and toner hopper 24 is pulled outward from image forming apparatus 42 so as to expose lid 40 of toner hopper 24, as shown in Figure 4.

After toner hopper 24, which is a locking-type toner hopper, has been pulled to the position shown in Figures 4 and 5, the protrusions 14 of key 10, are inserted into apertures 28 of locking mechanism 26, so as to release lid 40. Thereafter, lid 40 is opened as shown in Figure 7. As is well known, toner can be shaken before being filled into a toner reservoir, as shown in Figure 8. Toner is then poured into toner hopper 24, lid 40 is closed, hopper release lever 46 is closed and then access panel 44 is closed, as shown in Figures 9, 10 and 11, respectively.

Since the inside mechanisms of copiers are typically black, key 10 is preferably a color other than black, such as light grey, or any other color that visually distinguishes the key from other components inside conventional copiers. By forming the key in a color other than black, it is less likely that a user will inadvertently leave the key, such as key 10, inserted into a toner hopper lock, such as lock 26, during operation of the image forming device.

By using a key such as key 10, to open a locking-type toner hopper such as toner hopper 24, the present invention avoids the need for an end user to purchase a specially manufactured toner refilling device or container which has specialized components for coupling with hopper devices such as locking mechanism 26 and/or specialized engaging surfaces formed on hopper 24. These specialized containers are often complicated and/or expensive to design, manufacture or maintain and are therefore costly. Therefore, by using key 10, which is of simple design, an end user can avoid the cost and inconvenience associated with buying a complicated toner refilling device, since the hopper can be unlocked with the key and filled with a relatively simply designed toner bottle. Furthermore, by providing a key 10 with a plurality of projections 16 that are arranged so that two different toner hoppers can be unlocked with the key, a single key 10 can be packaged with one type of toner bottle, that can be used to refill any image forming apparatus that uses either of the two hoppers. Therefore, it will not be

necessary for retailers and end users to stock a different key for every different kind of image forming apparatus which they may have and/or sell parts for.

A toner refilling kit according to a further aspect of the present invention will be described below.

As shown in Figure 2, toner container 50 is packaged together with a toner hopper key such as key 10. In a presently preferred embodiment, key 10 is packaged together with toner container 50 via pouch 52. In the nonlimiting embodiment shown in Figure 2, pouch 52 is made out of a thin flexible material such as a foil or plastic in the form of a pouch. In this embodiment, key 10 is sealed within pouch 52. Preferably, toner container 50 has a generally funnel shaped upper end 54 terminating in an aperture 56 sealed with cap 58. In order to conveniently package key 10 within pouch 52 with toner container 50, pouch 52 includes an aperture in its upper end 60 which is made large enough to fit over aperture 56 of toner container 50 such that cap 58, when installed on toner container 50, as shown in Figure 2, securely attaches pouch 52 to a toner container 50.

By packaging toner container 50 with key 10 into a toner refill kit, a user is able to inexpensively refill an image forming apparatus, such as image forming apparatus 42 that includes a locking-type toner hopper 24, without having to buy the typically expensive, and specially designed toner refill cartridges typically sold for refilling locking-type toner hoppers. Additionally, by packaging toner container 50 with key 10, it is ensured that, even if a user has previously purchased but then lost a key 10, another key will be conveniently located when it is again time to refill toner hopper 24. By packaging a toner bottle together with a key that has a plurality of projections arranged to unlock at least two different locking-type toner hoppers, the present invention provides a single kit that can be used for refilling at least two different models of image forming apparatuses. Therefore, end users and/or retailers which stock such a toner

refilling kit, will not be burdened by the necessity to stock a specific toner refill kit for each model of image forming apparatus which they sell or maintain. Finally, by forming the toner container 50 with a funnel shaped upper end 54, the toner bottle can be used to refill toner hoppers of varying shapes. Therefore, the kit shown in Figure 2, can be used to fill a variety of different image forming apparatuses.

As discussed above, the present invention provides several important advantages over the toner refill kits of the prior art. For example, conventional toner hoppers may have locking toner reservoirs which, in order to be refilled, must be unlocked and engaged with a specialized container which is opened after engaging the container with the reservoir. After the hopper is refilled, the specialized container is disengaged and discarded or returned to the manufacturer for refilling. Therefore, by providing a key configured to unlock a locking type toner hopper, where the key is not monolithically formed with a toner container, the present invention allows a locking toner hopper to be easily and conveniently opened and refilled. Furthermore, since the specialized toner containers which are designed to unlock and engage corresponding specialized hoppers are complicated and costly to manufacture, the present invention provides a low cost alternative for users of photocopiers and other image forming apparatuses for their toner refilling needs.

In addition, according to a further aspect of the invention, by providing a kit that can be used to fill a variety of hopper devices, the present invention significantly reduces the burden on businesses, for example, who own or lease photocopiers. In particular, the present invention allows a user of photocopiers or image forming apparatuses to reduce the number of different specialized toner refill kits needed to refill the different types of photocopiers or of other image forming apparatuses they may operate.

Numerous additional modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the present invention may be practiced otherwise than as specifically described herein.